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ABSTRACT

The problems of air pollution and its control are discussed. Major consideration is given the sources of pollution - motor vehicles, industry, power plants, space heating, and refuse disposal. Annual emission levels of five principle pollutants - carbon monoxide, sulfur dioxide, nitrogen oxides, hydrocarbons, and particulate matter - are listed for each source. A short description of the control of stationary sources of pollution is also provided. The point is made that we have available today the technological means of controlling most sources of air pollution, but are not applying that technology in adequate measure. (BL)

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the sources of air pollution

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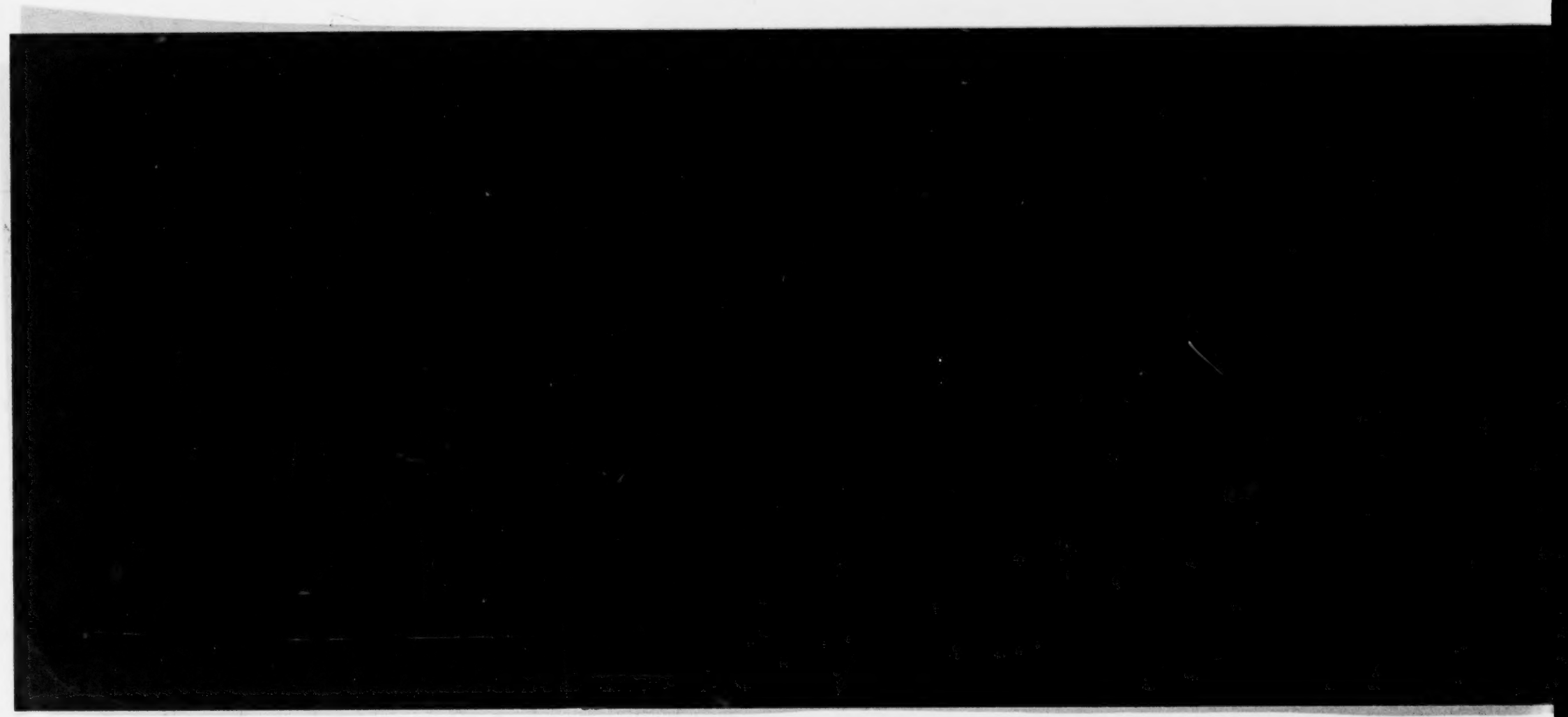


the sources of air pollution and their control

U.S. DEPARTMENT OF HEALTH,
EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

Consumer Protection and Environmental Health Service
National Air Pollution Control Administration
Arlington, Virginia 22203

The pollution of the air we breathe, ironically enough, is an indirect result of our pursuit of an ever higher standard of living. Air pollution derives from the burning of fuel for heat and power, from the processing of materials, and from the disposal of wastes. Air pollution, in short, comes from those everyday activities which are so integral a part of this modern, technologically advanced Nation.

What are the sources of air pollution?

We have available today the technological means of controlling most sources of air pollution. But we are not applying that technology in anything like adequate measure, and the problem of air pollution continues to grow. 3

Motor Vehicles

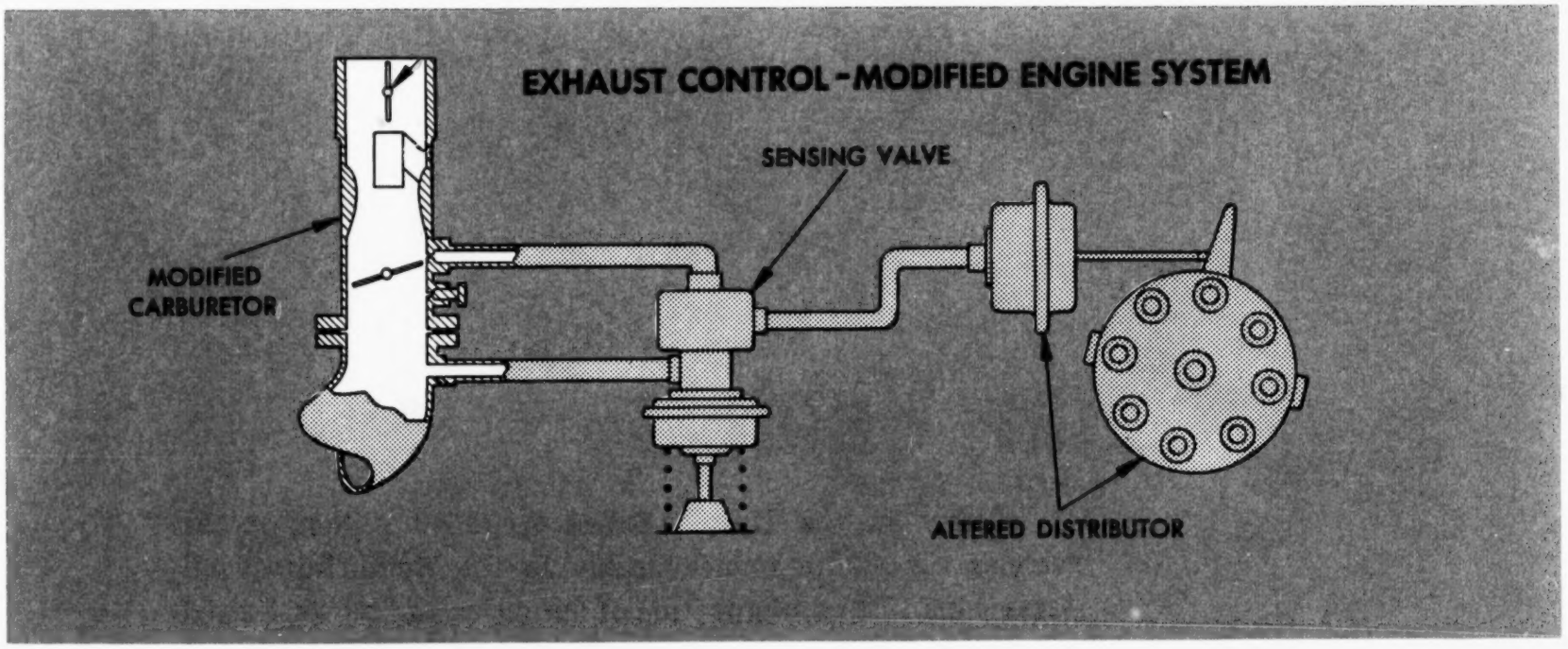
Today in the United States some 90 million motor vehicles contribute immeasurably to the well-being of all Americans. The configuration of our cities and towns, indeed our national habits and customs have been profoundly altered by this favorite of American machines.

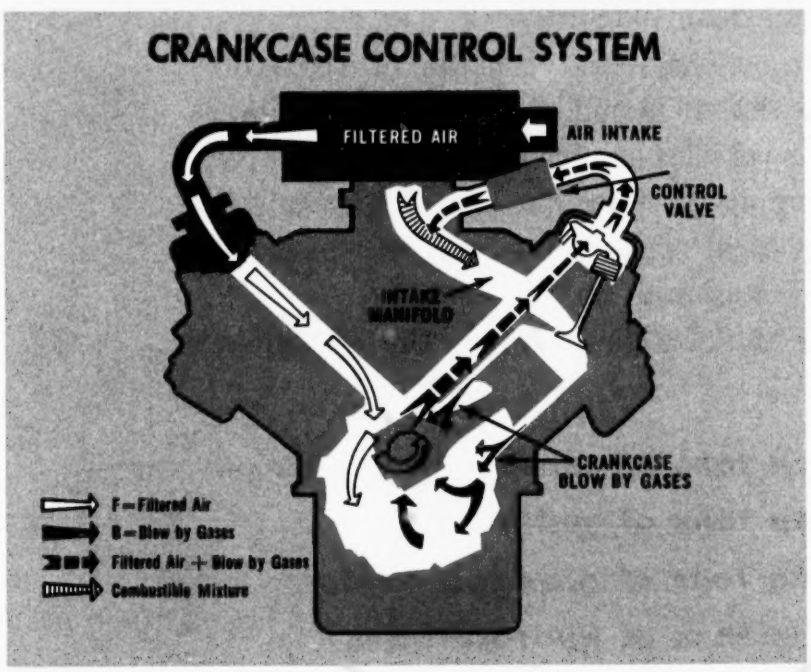
But while we enjoy the many benefits of the motor vehicle, we are aware that it is one of the principal sources of air pollution. Motor vehicles are the chief source of carbon monoxide, and they supply the ingredients which go into the formation of photochemical smog, the effects of which have been observed in every region of the country.

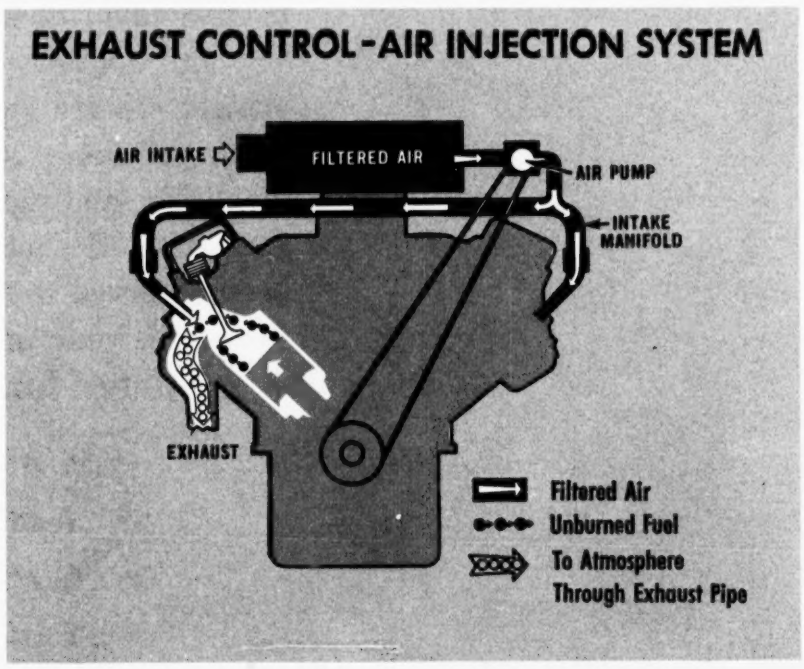
Each year motor vehicles discharge to the atmosphere of the United States . . .

- ***66 million tons of carbon monoxide***
- ***1 million tons of sulfur oxides***
- ***6 million tons of nitrogen oxides***
- ***12 million tons of hydrocarbons***
- ***1 million tons of particulate matter . . .***

plus chemicals that have been added to improve the quality of fuels, such as tetra-ethyl lead.


EXHAUST CONTROL - MODIFIED ENGINE SYSTEM
SENSING VALVE
MODIFIED CARBURETOR
ALTERED DISTRIBUTOR


CRANKCASE CONTROL SYSTEM
FILTERED AIR
AIR INTAKE
CONTROL VALVE
INTAKE MANIFOLD
CRANKCASE BLOW BY GASES
F — Filtered Air
B — Blow by Gases
Filtered Air + Blow by Gases
Combustible Mixture


EXHAUST CONTROL - AIR INJECTION SYSTEM
AIR INTAKE
FILTERED AIR
AIR PUMP
INTAKE MANIFOLD
EXHAUST
Filtered Air
Unburned Fuel
To Atmosphere Through Exhaust Pipe

Most of our motor vehicles (99 percent) are powered by the gasoline engine. Most of the gasoline engine vehicles in operation today discharge pollution from four points .

Gasoline is highly volatile, and the gas tank and the carburetor lose hydrocarbons through evaporation.

The gasoline engine is imperfect, and large amounts of unburned and partly burned hydrocarbons discharge from the tailpipe; smaller amounts blow by engine pistons to the crankcase, which vents to the air through a tube. Carbon monoxide, fuel impurities, and fuel additives discharge from the tailpipe.

Under the 1965 Amendments to the Clean Air Act, the Secretary of Health, Education, and Welfare has issued Federal emission standards for all new automobiles and light trucks sold in the United States beginning with model year 1968. The standards prohibit any emission from the crankcase, and require roughly a 50 percent reduction in hydrocarbon and carbon monoxide emissions from the tailpipe. The standards are applicable for the life of the vehicle, which for the purpose of the standards, is defined as 100,000 miles.

The Federal standards will bring about a gradual but substantial reduction in automotive pollution in this country. However, the estimated increase in the number of vehicles in this country will soon overtake the progress we make. To deal with this, lower limits on hydrocarbon and carbon monoxide emissions for model year 1970 cars and trucks, and the extension of these standards to other classes of vehicles will be applied. Regulations for controlling evaporative hydrocarbon losses from gas tanks and carburetors have been developed for application to 1971 models. With 1970 models, trucks and buses will have limitations on the smoke from their diesel engines. Methods of regulating nitrogen oxides from gasoline engines are being investigated as are methods of controlling diesel smoke odor.

Assuming that the upward trend in vehicle population continues, add-on devices and engine modifications may eventually fail to achieve the needed control; power sources that are fundamentally pollution free may be required.

Stationary Sources

industry

At the beginning of this century few of us could have conceived of how rapidly we were to change our lives. In an incredibly short time we fashioned from the abundant resources of this country the most advanced and the most prosperous Nation in the history of mankind.

But we have been so intent on reaping the benefits of the American Industrial Revolution that we have failed to give enough attention to the byproduct problems our successes have created.

The very industries that provide us with the materials of the good life also contribute a major share of the gases and particles that contaminate the air we breathe.

The major industrial contributors to air pollution in the United States are . . .

- ***Pulp and paper mills***
- ***Iron and steel mills***
- ***Petroleum refineries***
- ***Smelters***
- ***Inorganic chemical manufacturers, such as fertilizer manufacturers***
- ***Organic chemical manufacturers, such as synthetic rubber manufacturers***

Each year those industries discharge to the atmosphere . . .

2 million tons of carbon monoxide
9 million tons of sulfur oxides
2 million tons of nitrogen oxides
4 million tons of hydrocarbons
6 million tons of particulate matter

power plants

In 1966 we consumed roughly 1,250 billion kilowatt hours of electricity. Most of this energy (more than 95 percent) was generated by burning coal and oil, which contain elemental sulfur as an impurity. When these fuels are burned the sulfur also burns to form sulfur oxides, which are one of the most serious and prevalent forms of air pollution in the United States today. As can be seen from the below listed quantities of pollution annually discharged to the air by power plants, they are a major source of air pollution, particularly sulfurous pollution . . .

1 million tons of carbon monoxide

12 million tons of sulfur dioxide

3 million tons of nitrogen oxides

<1 million tons of hydrocarbons

3 million tons of particulate matter

space heating

The fuel we burn each year to heat our homes, apartments, and offices goes up the chimney as . . .

2 million tons of carbon monoxide

3 million tons of sulfur oxides

1 million tons of nitrogen oxides

1 million tons of hydrocarbons

1 million tons of particulate matter

refuse disposal

The annual production of solid waste in the United States is roughly 145 million tons. This means that, on the average, each of us throws away each year about 1,800 pounds of such things as paper, grass, garbage, ashes, metal, and glass. In disposing of these materials we annually create these quantities of aerial garbage . . .

1 million tons of carbon monoxide

<1 million tons of sulfur oxides

<1 million tons of nitrogen oxides

1 million tons of hydrocarbons

1 million tons of particulate matter

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control of stationary sources of pollution

Most of the pollutants that stationary sources discharge to our atmosphere today can be captured before they reach the air. Industrial gases can be washed out by scrubbers or adsorbed on materials like charcoal. Some gases can be burned to form harmless products. Particulates can be removed by filters, by electrostatic precipitators, or by cyclones that whirl them out through centrifugal force. Ninety-nine percent of the dust and ash produced by an electric generating plant can be removed at a cost of less than one cent on the average electric bill. The open burning of a city's trash can be replaced by sanitary landfill or by efficient incineration.

For those pollutants, such as the sulfur oxides, for which methods of removal have not yet been fully developed, there are alternate means of control. Within reasonable cost limits, sulfur can be removed from fuel oils before they are burned, and in those areas where sulfurous pollution is a significant problem, fuels having a low content of sulfur can be used.

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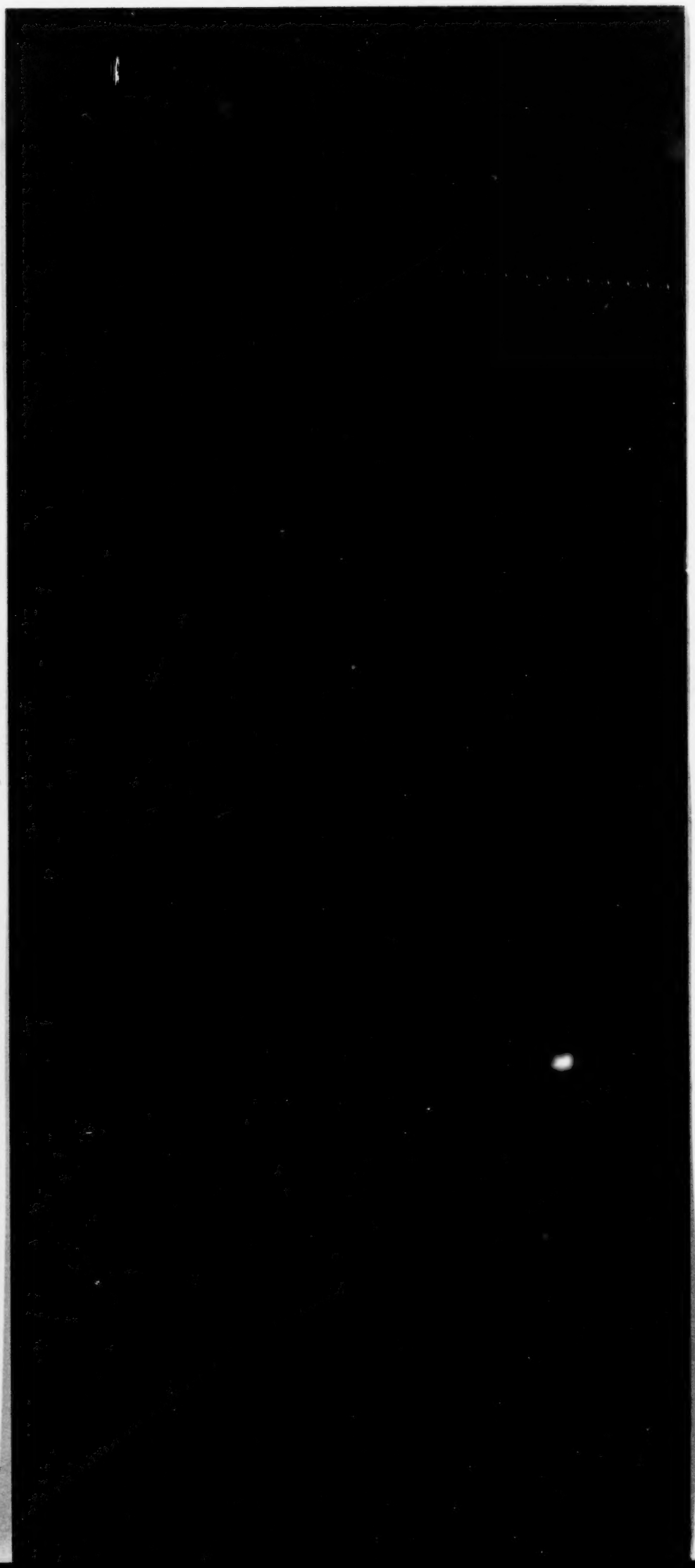

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